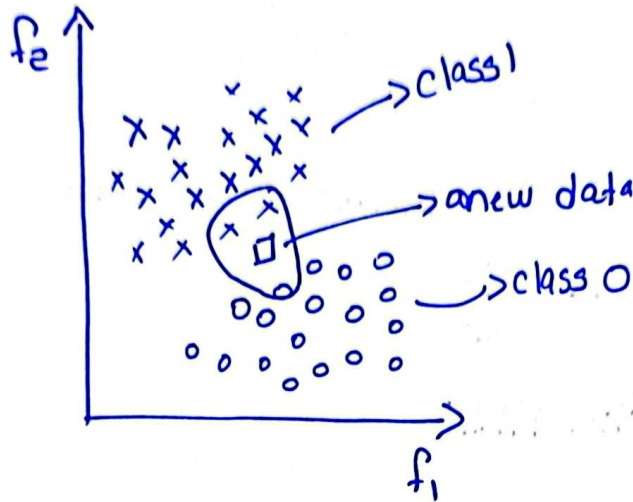


K-Nearest Neighbors (KNN)

→ KNN Classification



Steps:

- 1- We have to initialize K value
 $K > 0$ $\therefore K = 3$
- 2- Find the K -nearest neighbors for test data
- 3- Find From those K values, calculate the distance and check how many neighbors belong to classes.
4. Class with majority of neighbors, will be selected as the class for new data.

Distance Formulas:

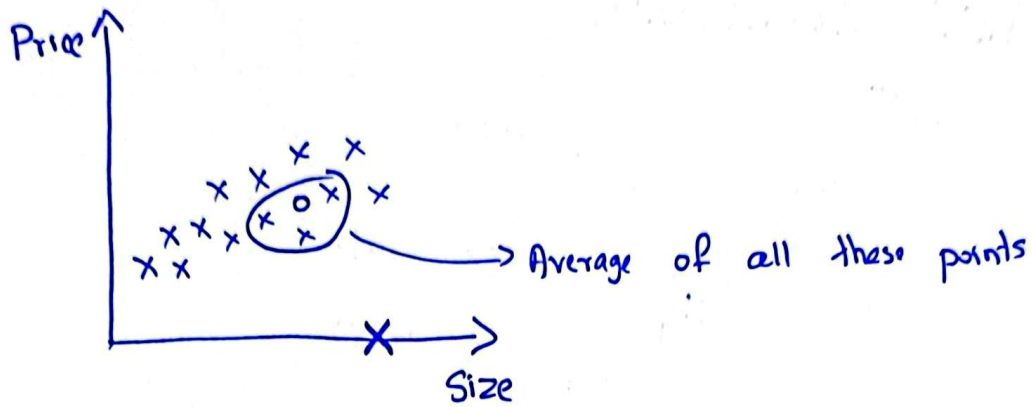
- 1- Euclidean Distance

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

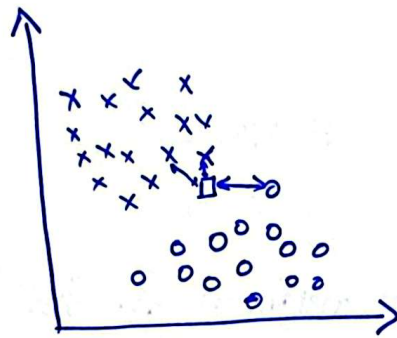
- 2- Manhattan Distance

$$|x_1 - x_2| + |y_1 - y_2|$$

→ KNN Regression



→ Problems with KNN



Time Complexity
 $O(n)$

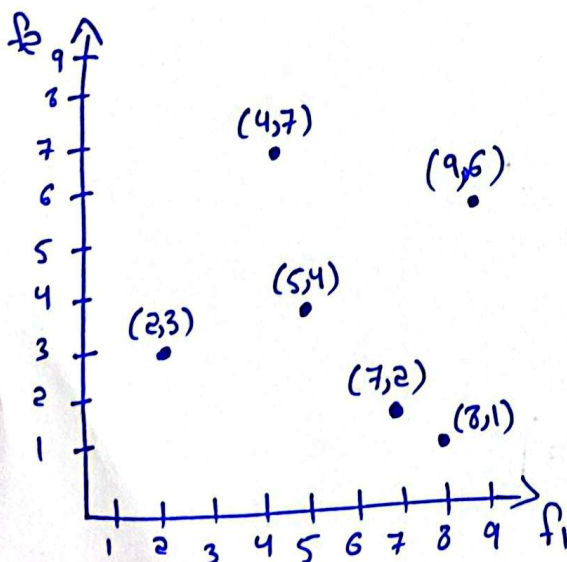
Optimization

1 - KD Tree

2 - Ball Tree

→ Optimization of KNN

> KD Tree



f_1	f_2
7	2
5	4
9	6
2	3
4	7
8	1

① calculate the median of f_1

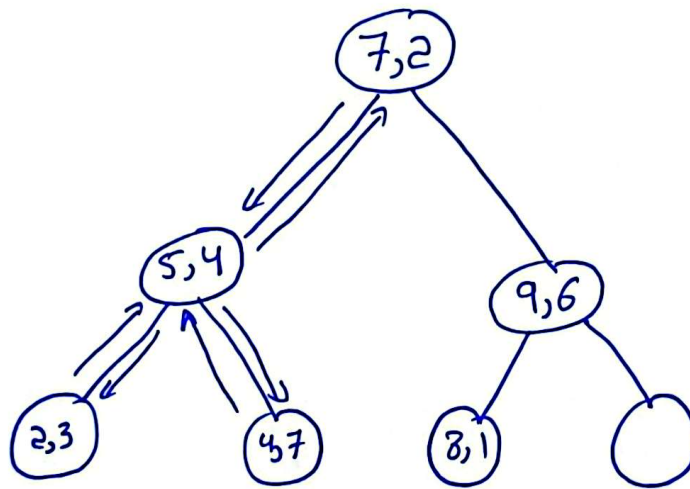
2, 4, 5, 7, 8, 9

$$\text{median} = \frac{5+7}{2} = 6$$

② calculate the median of f_2

1, 2, 3, 4, 6, 7

$$\text{median} = 3.5$$



Back Tracking is also possible

> Ball Tree

